



# SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai

Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &

Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B.Tech.IT)

COIMBATORE-641 035, TAMIL NADU



## Mensuration 2D Formula & Aptitude Questions

**1: Find the perimeter and area of an isosceles triangle whose equal sides are 5 cm and height is 4 cm.**

**Solution:**

*Applying Pythagoras' theorem,*

$$(Hypotenuse)^2 = (Base)^2 + (Height)^2$$

$$\Rightarrow (5)^2 = (0.5 \times \text{Base of isosceles triangle})^2 + (4)^2$$

$$\Rightarrow 0.5 \times \text{Base of isosceles triangle} = 3$$

$$\Rightarrow \text{Base of isosceles triangle} = 6 \text{ cm}$$

$$\text{Therefore, perimeter} = \text{sum of all sides} = 5 + 5 + 6 = 16 \text{ cm}$$

$$\text{Area of triangle} = 0.5 \times \text{Base} \times \text{Height} = 0.5 \times 6 \times 4 = 12 \text{ cm}^2$$

**2: A rectangular piece of dimension 22 cm x 7 cm is used to make a circle of the largest possible radius. Find the area of the circle formed.**

**Solution:**

*In questions like this, the diameter of the circle is lesser in length and breadth.*

*Here, the breadth Diameter of the circle = 7 cm*

$$\Rightarrow \text{Radius of the circle} = 3.5 \text{ cm}$$

$$\text{Therefore, area of the circle} = \pi (\text{Radius})^2 = \pi (3.5)^2 = 38.50 \text{ cm}^2$$

**3: A pizza is to be divided into 8 identical pieces. What would be the angle subtended by each piece at the center of the circle?**

**Solution:**

*By identical pieces, we mean that area of each piece is the same.*

$$\Rightarrow \text{Area of each piece} = (\pi \times \text{Radius}^2 \times \theta) / 360 = (1/8) \times \text{Area of circular pizza}$$

$$\Rightarrow (\pi \times \text{Radius}^2 \times \theta) / 360 = (1/8) \times (\pi \times \text{Radius}^2)$$

$$\Rightarrow \theta / 360 = 1 / 8$$

$$\Rightarrow \theta = 360 / 8 = 45$$

*Therefore, the angle subtended by each piece at the center of the circle = 45 degrees*



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**4: Four cows are tied to each corner of a square field of side 7 cm. The cows are tied with a rope such that each cow grazes the maximum possible field and all the cows graze in equal areas. Find the area of the ungrazed field.**

**Solution:**

*For maximum and equal grazing, the length of each rope has to be 3.5 cm.*

$$\Rightarrow \text{Area grazed by 1 cow} = (\pi \times \text{Radius}^2 \times \theta) / 360$$

$$\Rightarrow \text{Area grazed by 1 cow} = (\pi \times 3.5^2 \times 90) / 360 = (\pi \times 3.5^2) / 4$$

$$\Rightarrow \text{Area grazed by 4 cows} = 4 \times [(\pi \times 3.5^2) / 4] = \pi \times 3.5^2$$

$$\Rightarrow \text{Area grazed by 4 cows} = 38.5 \text{ cm}^2$$

$$\text{Now, area of square field} = \text{Side}^2 = 7^2 = 49 \text{ cm}^2$$

$$\Rightarrow \text{Area ungrazed} = \text{Area of field} - \text{Area grazed by 4 cows}$$

$$\Rightarrow \text{Area ungrazed} = 49 - 38.5 = 10.5 \text{ cm}^2$$

**5: Find the area of the largest square that can be inscribed in a circle of radius 'r'.**

**Solution:**

*The largest square that can be inscribed in the circle will have the diameter of the circle as the diagonal of the square.*

$$\Rightarrow \text{Diagonal of the square} = 2r$$

$$\Rightarrow \text{Side of the square} = 2r / \sqrt{2}$$

$$\Rightarrow \text{Side of the square} = \sqrt{2}r$$

$$\text{Therefore, area of the square} = \text{Side}^2 = [\sqrt{2}r]^2 = 2r^2$$

**6: A contractor undertakes the job of fencing a rectangular field of length 100 m and breadth 50 m. The cost of fencing is Rs. 2 per meter and the labor charges are Re. 1 per meter, both paid directly to the contractor. Find the total cost of fencing if 10 % of the amount paid to the contractor is paid as tax to the land authority.**

**Solution :**

$$\text{Total cost of fencing per meter} = \text{Rs. } 2 + 1 = \text{Rs. } 3$$

$$\text{Length of fencing required} = \text{Perimeter of the rectangular field} = 2(\text{Length} + \text{Breadth})$$

$$\Rightarrow \text{Length of fencing required} = 2 \times (100 + 50) = 300 \text{ meter}$$

$$\Rightarrow \text{Amount paid to the contractor} = \text{Rs. } 3 \times 300 = 900$$



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$\Rightarrow$  Amount paid to the land authority = 10 % of Rs. 900 = Rs. 90  
therefore, total cost of fencing = Rs. 900 + 90 = Rs. 990

## Mensuration 3D Aptitude Questions & Answers

**1: Find the length of the largest rod that can be kept in a cuboidal room of dimensions 10 x 15 x 6 m.**

**Solution:**

*Largest rod would lie along the diagonal.*

$\Rightarrow$  Length of largest rod = Length of diagonal of the room =  $(L^2 + B^2 + H^2)^{1/2}$

$\Rightarrow$  Length of the largest rod =  $(10^2 + 15^2 + 6^2)^{1/2} = (100 + 225 + 36)^{1/2} = (361)^{1/2}$

$\Rightarrow$  Length of the largest rod = 19 m

**2: Find the number of bricks of dimension 24 x 12 x 8 cm each that would be required to make a wall 24 m long, 8 m high and 60 cm thick.**

**Solution:**

*Volume of 1 brick = 24 x 12 x 8 = 2304 cm<sup>3</sup>*

*Volume of wall = 2400 x 800 x 60 = 115200000 cm<sup>3</sup>*

*Therefore, number of bricks required = 115200000 / 2304 = 50000*

**3: A rectangular sheet of paper measuring 22 cm x 7 cm is rolled along the longer side to make a cylinder. Find the volume of the cylinder formed.**

**Solution:**

*Let the radius of the cylinder be 'R'.*

*The sheet is rolled along the longer side.*

$\Rightarrow 2\pi R = 22$

$\Rightarrow R = 3.5$  cm

*Also, height = 7 cm*

*Therefore, volume of the cylinder =  $\pi R^2 H = \pi (3.5)^2 7 = 269.5$  cm<sup>3</sup>*



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**4: If each edge of a cube is increased by 10 %, what would be the percentage increase in volume?**

**Solution:**

*Let the original edge length be 'a'*

$\Rightarrow$  Original volume =  $a^3$

*Now, new edge length =  $1.1 a$*

$\Rightarrow$  New volume =  $(1.1 a)^3 = 1.331 a^3$

$\Rightarrow$  Increase in volume =  $1.331 a^3 - 1 a^3 = 0.331 a^3$

*Therefore, percentage increase in volume =  $(0.331 a^3 / a^3) \times 100$   
= 33.1 %*

**5: Three metal cubes of edge lengths 3 cm, 4 cm, and 5 cm are melted to form a single cube. Find the edge length of such a cube.**

**Solution:**

*Volume of new cube = Volume of metal generated on melting the  
cubes = Sum of volumes of the three cubes*

$\Rightarrow$  Volume of new cube =  $3^3 + 4^3 + 5^3 = 216$

$\Rightarrow$  Edge length of new cube =  $(216)^{1/3} = 6 \text{ cm}$

**6: Find the length of a 1.25 m wide metal sheet required to make a conical machine of radius 7 m and height 24 m.**

**Solution:**

*The sheet would be shaped into a cone.*

$\Rightarrow$  Area of sheet = Area of conical machine

$\Rightarrow 1.25 \times \text{Length} = \pi \times R \times L$

$\Rightarrow 1.25 \times \text{Length} = \pi \times R \times (7^2 + 24^2)^{1/2}$

$\Rightarrow 1.25 \times \text{Length} = \pi \times 7 \times 25$

$\Rightarrow \text{Length} = 440 \text{ m}$

*Thus, 440 m long metal sheet is required to make the conical machine.*

**7: From a cylindrical vessel having a radius of the base of 7 cm and a height 6cm, water is poured into small hemispherical bowls each of radius 3.5 cm. Find the minimum number of bowls that would be required to empty the cylindrical vessel.**



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## Solution :

$$\text{Volume of cylindrical vessel} = \pi R^2 H = \pi (72) 6 = 924 \text{ cm}^3$$

$$\text{Volume of each bowl} = (2/3) \pi R^3 = (2/3) \pi 3.53 = 269.5 / 3$$

$$\Rightarrow \text{Number of bowls required} = (924) / (269.5 / 3) = 10.28$$

But since a number of bowls cannot be in fractions, we need at least 11 such bowls to empty the cylindrical vessel.

## MCQ Questions

1. Total surface area of cylinder is  $704 \text{ cm}^2$  and ratio of height and base radius of the cylinder is 3 : 4, then what will be the volume of that cylinder?

1.  $384\pi \text{ cm}^3$

2.  $243\pi \text{ cm}^3$

3.  $518\pi \text{ cm}^3$

4.  $423\pi \text{ cm}^3$

## Ans:

Let height and base radius of the cylinder is  $3x$  and  $4x$  respectively.

Total surface area of the cylinder =  $2\pi r(h + r)$

$$704 = 2 \times (22/7) \times 4x \times (3x + 4x)$$

$$\Rightarrow 704 = 176x/7 \times (3x + 4x)$$

$$\Rightarrow 704 = 176x^2$$

$$\Rightarrow x^2 = 4$$

$$\Rightarrow x = 2$$

Base radius =  $4x = 8 \text{ cm}$

Height =  $3x = 6 \text{ cm}$

$$\text{Volume of the cylinder} = \pi r^2 h = \pi \times 64 \times 6 = 384\pi \text{ cm}^3$$

2. If the length of the side of the rhombus is  $10 \text{ cm}$  and the length of the shorter diagonal is  $12 \text{ cm}$  then what is the area of the rhombus?

1.  $96 \text{ cm}^2$

2.  $108 \text{ cm}^2$

3.  $80 \text{ cm}^2$

4.  $144 \text{ cm}^2$

## Ans:



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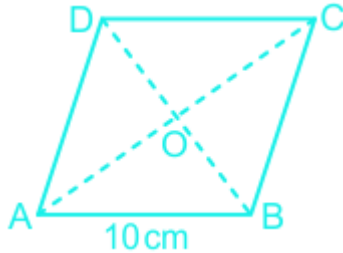
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By observing the given diagram and as we know that AOB is a right-angle triangle.

$$\Rightarrow OB = 12/2 = 6\text{cm}$$

$$\Rightarrow AO = \sqrt{(100 - 36)} \text{ (Using Pythagoras theorem)}$$

$$\Rightarrow 8\text{cm}$$

$$\Rightarrow AC = 16\text{cm}$$

$$\Rightarrow \text{Area of the diagonal} = (1/2) \times AC \times BD$$

$$\Rightarrow (1/2) \times 16 \times 12 = 96 \text{ cm}^2$$

3. What is the volume of a hexagonal prism of base length 5 cm and height  $4\sqrt{3}$  cm?

1. 360 cm<sup>3</sup>

2. 420 cm<sup>3</sup>

3. **450 cm<sup>3</sup>**

4. 480 cm<sup>3</sup>

**Ans:**

Volume of prism = Area of base  $\times$  Height

Area of hexagonal base =  $3\sqrt{3}/2 \times \text{side}^2$

$$\Rightarrow 3\sqrt{3}/2 \times 5^2 = 75\sqrt{3}/2$$

Volume of prism =  $75\sqrt{3}/2 \times 4\sqrt{3}$

$$\Rightarrow 450 \text{ cm}^3$$

4. The area of the circular park is 5544 m<sup>2</sup>. There is a 7m wide path for running inside the park. Park owners decide to pave the running track. If the cost of paving Rs 12 per meter square then find the total cost of paving the running track of the park.

1. Rs 12500

2. Rs 24520

3. Rs 18540

4. **Rs 20328**

**Ans:**

Area of circular park =  $\pi r^2$

$$\Rightarrow 5544 = \pi r^2$$

$$\Rightarrow r^2 = 5544/\pi = 1764 \text{ (where } \pi = 22/7)$$



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$$\Rightarrow r = \sqrt{1764} = 42 \text{ m}$$

Path length is 7 m (given)

Inner circle area (without including path area)

$$\text{Radius of inner circle} = (42 - 7) \text{ m} = 35 \text{ m}$$

$$\text{Area}_2 = \frac{22}{7} \times 35 \times 35 = 3850 \text{ m}^2$$

$$\text{Total area of path} = \text{Area}_1 - \text{Area}_2$$

$$= (5544 - 3850) \text{ m}^2$$

$$= 1694 \text{ m}^2$$

$$\text{Total cost for paving} = 1694 \times 12$$

$$= \text{Rs } 20328$$

5. Amal has a toy that is in the shape of a regular tetrahedron and has a curved surface area of  $800 \text{ cm}^2$ . Each face of the tetrahedron has a height of 20 cm. What is the length of the base of one of the faces?

1. 20 cm

2. 10 cm

3. 15 cm

4. 21 cm

**Ans:**

As we know that the regular tetrahedron has 4 triangular faces.

$$\text{Area of one face} = 800/4 = 200 \text{ cm}^2$$

$$\text{Area of triangle} = \frac{1}{2} \times \text{base} \times \text{height.}$$

$$200 = \frac{1}{2} \times \text{base} \times 20$$

$$\text{Base} = 20 \text{ cm.}$$

6. Find the volume of a pyramid whose base is square in shape with an area of  $225 \text{ sq.cm}$ . and height is 11 cm.

1. 965 cu.cm

2. 741 cu.cm

3. 825 cu.cm

4. 786 cu.cm

**Ans:**

$$\text{Given Area of square base} = 225 \text{ cm}^2$$

$$h = 11 \text{ cm}$$

$$\text{The volume of pyramid} = \frac{1}{3} \times \text{Area of square base} \times h = \frac{1}{3} \times 225 \times 11 = 825 \text{ cm}^3$$



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7. Ratio of curved surface area to total surface area of cylinder is 11 : 18. Also, area of its circular end is 616 cm<sup>2</sup>. Find the volume of cylinder.

1. 11576 cm<sup>3</sup>
2. **13552 cm<sup>3</sup>**
3. 12785 cm<sup>3</sup>
4. 16415 cm<sup>3</sup>

**Ans:**

The curved surface area of the cylinder =  $2\pi rh$

The total surface area of the cylinder =  $2\pi r(r + h)$

Ratio =  $2\pi rh : 2\pi r(r + h) = h : (r + h)$

Now,  $h : (r + h) = 11 : 18$

$\Rightarrow 18h = 11r + 11h$

$\Rightarrow 7h = 11r$

$\Rightarrow h/r = 11/7$

Also,  $\pi r^2 = 616$

$\Rightarrow r^2 = 616/\pi$

$\Rightarrow r^2 = 196 = 14^2$

$\Rightarrow h/r = 11/7$  (if r is 14, then h must be 22)

Volume =  $\pi \times r^2 \times h = (22/7) \times 14 \times 14 \times 22 = 13552 \text{ cm}^3$

8. The length and breadth of a rectangle are in a ratio 2 : 1 and the perimeter of the rectangle is 48 cm. Find the area of the rectangle.

1. **128 cm<sup>2</sup>**
2. 256 cm<sup>2</sup>
3. 64 cm<sup>2</sup>
4. 144 cm<sup>2</sup>

**Ans:**

Area of rectangle = Length  $\times$  Breadth

Perimeter of rectangle = 2(Length + Breadth)

Let, the length is 2x and the breadth is x (since the ratio is 2 : 1).

Now given,

$\Rightarrow 48 = 2(2x + x)$

$\Rightarrow 48 = 6x$

$\Rightarrow x = 8$

So, Length = 16 cm and Breadth = 8 cm

Area =  $16 \times 8 = 128 \text{ cm}^2$





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9. The sides of the right-angle triangular park are in ratio 3 : 4. The sum of all sides is 144 m. Find the area of the triangular park.

1. 894 m<sup>2</sup>
2. **864 m<sup>2</sup>**
3. 926 m<sup>2</sup>
4. 1024 m<sup>2</sup>

**Ans:**

The park is of right angle triangle shape so, the triplet of sides is (3,4,5).

Let the side of the park be 3x, 4x, 5x

Sum of sides = 12x = 144

⇒ x = 12

Thus, sides are 36 m, 48 m, 60m

The area of triangle =  $(1/2) \times 36 \times 48 = 864 \text{ m}^2$

10. What is the volume of the sphere whose radius is 14cm?

1. 22158.33
2. 11699.67
3. 11250.33
4. **None of these**

**Ans:**

The volume of the sphere =  $(4/3)\pi r^3$

Where r is the radius of the sphere.

⇒  $(4/3) \times (22/7) \times 14 \times 14 \times 14$

⇒ 11,498.66 cm<sup>3</sup>